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Effects of abiotic stresses on *Achnatherum inebrians* by symbiotic endophyte of *Neotyphodium gansuense*

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Key words: drunken horse grass, *Neotyphodium* endophytes, drought resistance, salt tolerance

Introduction Drunken horse grass (*Achnatherum inebrians*) is an intoxicating grass that grows in the native grasslands of Northwest China, with high infection rate by endophyte *Neotyphodium gansuense* (Li *et al.*, 2004a; Li *et al.*, 2004b). The response to this grass by biotic stresses, i.e.: grass pathogenic fungi and pests, have been reported (Li *et al.*, 2007a). In this paper, the responses to abiotic stresses of drought and salt were studied.

Materials and Methods

1. Endophyte-infected (E⁺) and endophyte free (E⁻) plants of *Achnatherum inebrians* were established from seeds collected from Yuzhong, Gansu, China.
2. Plant growth and physiological characteristics on *A. inebrians* were studied under light drought (40% water holding capacity, WHC) and strong drought (20% WHC) stresses and their recovery effects after strong stresses by pot experiment under controlled watering conditions.
3. Plant growth and physiological characteristics on *A. inebrians* were studied under salt stresses of 100, 200, 300 mmol/L NaCl in 1/2 Hoagland solution and their recovery effects after strong stresses by pot experiment under controlled watering solution conditions.

Results and Discussion

Drought stress Under drought stress conditions, the oxidative damage of E⁺ plants from arid area was significantly lower than that of E⁻ plants ($p < 0.05$), the superoxide dismutase (SOD) activity of E⁺ leaves was significantly lower than that of E⁻ leaves ($p < 0.05$). Endophyte could obviously promote leaf proline accumulation and underground biomass accumulation ($p < 0.05$), increase or maintain underground biomass, change biomass pattern by redistributing root and shoot ratio. However, the effects of endophyte on tiller number, leaf growth and leaf relative water content (LRWC) of *A. inebrians* were not significantly different ($p > 0.05$).

Endophyte could enhance *A. inebrians* recovery by increasing tiller and leaf growth, slowing down the degradation of proline after strong drought stress.

Salt stress Under salt stress conditions, compared with E⁻ plants, E⁺ plants had better vegetative growth and water protection. Tiller number, plant height and LRWC were significantly increased ($p < 0.05$).

Endophyte could improve *A. inebrians* recovery after strong salt stress by increasing plant growth and water protection. Tiller number, plant height and LRWC of E⁺ plants were significantly increased ($p < 0.05$) under salt stress conditions.

Conclusions

1. *Neotyphodium* endophytes could increase drought resistance to *A. inebrians* and its recovery after strong drought stress.
2. *Neotyphodium* endophytes could increase salt tolerance to *A. inebrians* and its recovery after higher NaCl stress.

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